Energy may be defined as work which is stored up. Work stored up in overcoming kinetic reactions is called kinetic energy. Work stored up in overcoming non-frictional forces, such as gravitational forces, is called potential energy. Work done in overcoming frictional forces is called heat energy.

Potential, kinetic and heat energy are different (at least apparently[2]) forms of the same physical entity, *i. e.*, energy. Energy may be changed from any one of these forms into any other form. Whenever such a change takes place energy is said to be transformed. Transformation of energy is always accompanied by work. In fact the process of doing work is that of transformation of energy. The amount of energy transformed equals the amount of work done.[3]

Yale University

UNITS OF FORCE

To the Editor of Science: I have read with much interest Professor Kent's article in Science on the units of force. I might say that I have taught mechanics in my physics course this year, using the units the way Professor Kent recommends. The results have been entirely successful and highly gratifying. I used the pound and the gram as the units of mass and the pound and the gram as the units of force. As far as the results to the student go it has resulted in conciseness and clearness of thought and an avoidance of the unescapable confusion that results from introducing units that nobody but a teacher of physics wishes to use. Not only did this apply to force equations but it had a good result all along the line in problems on work energy and power. I embodied in my method of teaching the things that Professor Kent recommends and also many of the things that Professor Huntington recommends. I believe that a great deal of the trouble is due to the fact that most of our teachers of physics do not have the point of view of the engineer (they should have if they teach engineers) and I believe that the only way to get this point of view is in the school of practical engineering. This hodgepodge of units which some of us wish to use are undesirable and pedagogically unsound.

Paul Cloke

[2] Recent developments in physical sciences tend to show that differences between different forms of energy are only apparent and that all forms of energy are, in the last analysis, kinetic.

[3] H. M. Dadourian, "Analytical Mechanics," 2d edition, p. 248. H. M. Dadourian

THERMOMETER SCALES

To the Editor of Science: In a letter published in Science of May 5, 1916, page 642, a correspondent advocating the retention of the Fahrenheit scale says that "nine tenths, probably, of the use of the thermometer is for the weather" a statement that should not pass unchallenged; but even if there were no other uses of the thermometer, the Fahrenheit scale would still be objectionable. If your correspondent will visit any extensive meteorological library, he will find that nearly all national weather services now use the Centigrade scale and that internationally no other scale has been recognized for some years. Even the few weather services retaining the Fahrenheit scale, restrict its use and banish it from all investigational and research work.

It is urged that "the common people are familiar with the Fahrenheit scale." They may be familiar with it and yet not understand it. When the temperature is 64° F., is it clearly understood by every one, that the temperature is 32 degrees above freezing; and on the other hand when it is —32° F., that the temperature is 64 degrees below freezing? The scale says one thing and means another. It is true that the Centigrade scale division is nearly twice the length of the other scale division; and much has been made of this by some who insist upon accuracy to the tenth of a degree; but it may be well to remember that most air temperatures are a degree or more in error. Even with official instruments, errors of exposure or time, exceeding several degrees, go uncorrected, while instrumental errors are applied to a tenth of a degree. On the daily weather map one finds isotherms charted from readings made at different hours and different elevations. A reading made at 5 A.M. in the Nevada desert is linked up with readings made at 8 A.M. on the Atlantic seaboard. Some years ago, I suggested to the

former chief of the Weather Bureau that the hour of observation be given at the top of the map; and the suggestion was adopted; but the type used is small and at best this is only a makeshift. If the isotherms are to have true comparative value, diurnal corrections should be applied, whatever scale be used to express values.

At Blue Hill Observatory, no less than three scales have been used and we are now considering a fourth. Beginning with 1891, the Centigrade scale displaced Fahrenheit in our published summaries. In 1914 the Absolute scale displaced the Centigrade, the first of the three figures being written once in tabular work at the head of the column. The use of minus signs for low temperatures, frequent in winter months for surface readings, and in all months with upper air readings, is thus avoided.

The objection made, however, to the length of the Centigrade division holds also for the Absolute scale and therefore the writer suggested[1] a scale based on the Absolute system but with the present 273° marked 1,000°.

For many reasons the freezing point is important. The new scale emphasizes this point. The boiling point is not so definitely marked but the whole system has the advantage of flexibility and consistency. For thermodynamic problems it is an ideal arrangement.

ALEXANDER MCADIE

SCIENTIFIC BOOKS

American Civilization and the Negro. By C. V. ROMAN, A.M., M.D., LL.D., Editor of the Journal of the National Medical Association, etc. Philadelphia, F. A. Davis Co., 1916.

This book is obviously prepared and published as an antidote for Shufeldt's book on the negro, issued last year by the same firm.[1] As such, it is a complete and amusing success. The word "amusing" is used advisedly, for Dr. Roman has by imitation without comment emphasized many of the weaknesses and defects of Dr. Shufeldt's book. Moreover like most of his race, Dr. Roman has a keen sense of humor and real skill in the use of witty phrases, so that many of his aphorisms are exceedingly clever. From the title-page, with its long list of degrees, honors and positions, following the author's name, to the very full glossary at the end of the book, Roman has taken his cue from Shufeldt, with such good-natured appreciation of the Caucasian author's failings that any one who has read both books can not help but be amused. In no respect is this done better than in the matter of illustrations. In neither volume is there any particular connection between text and plates, but whereas Shufeldt's figures are deliberately chosen to exaggerate the animal nature of the negro and make him repulsive to the reader, Roman's illustrations are selected to exaggerate his intellectual and spiritual achievements and make him most attractive.

Neither volume is in any real sense a scientific book, but whereas Shufeldt's pretends to be, Roman's makes no such claim. The latter author says truly in his Preface: "This book is written without bitterness and without bias" and in the hope that it "may increase racial self-respect and diminish racial antagonism." The good nature and self-control of the author are notable and his evident familiarity with the literature of the subject is equally so. There are very few references to Shufeldt, Bean or other negrophobists, but many quotations from Boaz, Murphy and Cable, real and sympathetic students of the race problem. The chief contention of the author is that there is no superior *race,* but that there are superior *individuals,* and that the effort of all races should be to increase the number of these superior individuals of whatever race, while weeding out the inferior. He admits frankly that at the present time, the whites average higher than the negroes but he very properly claims that there is far less difference between the best whites and the best negroes than there is between the better and worse elements of either race. His chief protest is against the utterly unfair and unscientific method of treating all colored people alike because they are colored, and he emphasizes the

[1] *Physical Review,* N. S., Vol. VI., No. 6, Dec., 1915.

[1] See SCIENCE, N. S., Vol. 42, p. 768.